

Chondrina, it becomes type of that group. No type had been selected previously for *Chondrus*. *Chondrina* will therefore replace *Modicella* Ads., 1854, as used by Boettger and Westerlund. So far as I know, the other names proposed had all been provided with valid names previously.

The work covers the invertebrates only. There are some new generic names in other Classes, as well as those in *Mollusca* noticed above.

H. A. PILSBRY.

FURTHER NOTES ON THE MOLLUSCA OF ONEIDA LAKE, NEW YORK;
THE MOLLUSKS OF LOWER SOUTH BAY.

BY FRANK C. BAKER.

In a previous paper¹ the writer listed the fresh-water mollusks of the west end of Oneida Lake, 62 species and races being represented. In the present paper the fresh-water mollusks of a large bay in Oneida Lake are listed, the additional material bringing the total molluscan fauna of the lake to 91 species and races, of which 5 are new to science. It is highly probable that half the species of fresh-water mollusks inhabiting the State will be found in Oneida Lake when the east end, the deep water, and the small tributary streams are examined. The additional Sphæriidæ collected in 1916 is noteworthy, bringing the total number to 32, of which 23 are *Pisidia*. The deeper water also added several species of note not found in 1915.

Mollusks were abundant everywhere, being absent from less than one percent of the area examined. Associated with the mollusks were oligochæte worms, planarians, leeches, amphipods and other crustaceans, fresh-water insects and insect larvæ, and the little water mites, forming together a veritable microcosm, in which the majority of fresh-water groups of animals were represented. In point of numbers the mollusks usually predominated. The studies in Lower South Bay were carried on quantitatively for the purpose of ascertaining the available amount of fish food present in this body of water and its im-

¹The NAUTILUS, xxx, pages 5-9, 1916.

mediate vicinity. During the field work, 18,440 specimens were collected, of which, 9335 were mollusks. Ecological notes were made on all of the species in connection with the environment and with the associated animals. The discussion of these topics, many of which are of an economic nature, will be published as a technical bulletin by the New York State College of Forestry, and the interested reader is referred to this publication for details concerning these and kindred subjects.

When the field work was made for the material upon which Technical Bulletin Number IV (page 89) is founded the deeper water of the west end of the lake was examined with a crowfoot dredge, and, naturally, only a few mussels were obtained. For the field work of 1916 a large dredge with a 16-inch frame was used with very satisfactory results, a large number of clams as well as gastropods being collected. When these results were tabulated an interesting variation in bathymetrical distribution was observed. This is indicated in the table below:

Table showing decrease of mollusks with depth.

Shore to six inches	6 species
1 to 3 feet	46 species
3 to 6 feet	40 species
6 to 9 feet	39 species
9 to 12 feet	29 species
12 to 15 feet	26 species
15 to 18 feet	11 species

Lower South Bay is the largest embayment of Oneida Lake and is situated at the southwest end. It is about one by two miles in extent and covers an area of approximately 881 acres. It is well protected on the north by Long Point which extends eastward into the lake for nearly a mile, forming an effectual barrier to the heavy north and northwest storms. Between Long Point and Short Point (see the map in Technical Bulletin, IV) lies Short Point Bay where the water is usually quiet and the habitats are sheltered from strong waves. The greater part of the shore is of sand or clay, a very small proportion being of gravel and boulders. The deeper water has a mud bottom. The 881 acres included in the area of Lower South Bay is divided as follows:

Boulder and gravel bottom . . .	20 acres
Sand bottom	85 acres
Clay bottom	92 acres
Mud bottom	684 acres
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Total acreage	881

Plant life is very abundant in the bay and it is due to the great quantity of this life that the animal life is so abundant. The submerged plants are the most abundant in species, *Potamogeton*, *Najas*, *Elodea*, *Vallisneria* and *Myriophyllum* being the principal genera represented. *Scirpus*, *Pontederia*, *Nymphæa* and *Castalia* are the most abundant of the emergent types of vegetation. The most surprising result of the plant analysis has been the presence of great quantities of filamentous and other algæ, the former in places fairly choking the water. Upwards of 36 species were found in the material examined by Dr. E. N. Transeau, including *Cladophora*, *Oedogonium*, *Ulothrix* and *Spirogyra* among the filamentous species. It was in this mass of algæ, which often formed a thick blanket, that the greater number of mollusks and other animals were found.

In the list of species to follow, reference is made to the depth of water and to the character of bottom upon which the species was found. As all but a very few were collected in Lower South Bay, the locations are given only where the species was found in a habitat outside of this area. My thanks are due Dr. H. A. Pilsbry, Dr. Bryant Walker, and Dr. V. Sterki for the determination of critical material. To Dr. C. C. Adams and Dr. Hugh P. Baker, of the New York State College of Forestry I am indebted for the opportunity of making the studies from which these notes are abstracted.

UNIONIDÆ.

Elliptio complanatus ("Solander" Dillwyn). In Technical Bulletin, IV, page 252, and in the NAUTILUS, XXX, page 8. reference is made to the presence of *Margaritana margaritifera* (L.) in the lake. This should be eliminated from the lists as it was founded upon pathologic individuals of *Elliptio complanatus*. This *Elliptio* is the commonest mussel in the lake occurring on

all kinds of bottom and in all depths of water examined. The deeper water individuals run considerably smaller than those from shallow water.

Anodonta cataracta Say. On all kinds of bottom in 3-8 feet of water.

Anodonta implicata Say. Found only on exposed shores in water two and a half to four feet deep, in sand between boulders.

Anodonta grandis footiana Lea. Occurs on all kind of bottom except boulder in water one and a half to 15 feet deep.

Lampsilis lutcola (Lam.). On all varieties of bottom except gravel in water 3-18 feet deep.

Lampsilis radiata (Gmelin). Found only in water one and a half to three feet deep on boulder, gravel, and sand bottom. Typical *radiata* is very rare in Oneida Lake.

Lampsilis radiata oneidensis Baker. Common in water from 8-18 feet deep on gravel and mud bottom, usually the latter. This species replaces *Lampsilis borealis* (Gray)¹ which does not occur in Oneida Lake.

SPHAERIIDAE.

Sphærium vermontanum Prime. The most abundant of these small clams, occurring in water from one and a half to 14 feet deep and on all varieties of bottom except boulder.

Sphærium solidulum (Prime). Occurs sparingly in water 8-18 feet deep on a mud bottom. Dr. Sterki characterizes it as a small eastern form.

Sphærium sulcatum (Lam.). Found only on a mud bottom in 8-13 feet of water. It is the rarest of these small clams and is a small, slight form, quite unlike the large heavy individuals found in other parts of New York State. It is an interesting case of bathymetrical distribution that *vermontanum* should occur at all depths examined but that *solidulum* and *sulcatum* should be found only at 8 feet and deeper. The last mentioned species was obtained only between 8 and 13 feet.

Musculium truncatum (Linsley). Clay bottom in four feet of water.

¹ See Technical Bulletin, IV, page 257; NAUTILUS, XXX, pages 74-77, 1916.

Musculium transversum (Say). Occurred on a sand and clay bottom in water one and a half to four feet deep. The individuals are smaller than is normal for the species.

Pisidium abditum Haldeman. Small specimens of this species were found on sand, clay, and mud bottoms, in one and a half to 8 feet of water.

Pisidium adamsi affine Sterki. Gravel bottom in 3 feet of water.

Pisidium complanatum Sterki. Gravel, sand and mud bottoms in water two to $8\frac{1}{2}$ feet deep.

Pisidium compressum Sterki. Common in water one and a half to 14 feet deep on gravel, sand, clay and mud bottoms.

Pisidium compressum lævigatum Sterki. Mud bottom in 13 feet of water.

Pisidium ferrugineum Prime. Occurs in water 3—8 feet deep on sand, clay, or mud bottom. It resembles eastern specimens from New England.

Pisidium neglectum Sterki. A few quite small specimens were collected on a mud bottom in $8\frac{1}{2}$ feet of water.

Pisidium overi Sterki. A single valve of this western species was found in a dredging from a mud bottom in 8 feet of water. This species was first described from South Dakota and was later found in Minnesota. Its occurrence in New York State gives it a wide range eastward.

Pisidium pauperculum Sterki. On sand and mud bottoms in one and a half to 8 feet of water.

Pisidium punctatum simplex Sterki. On sand and sandy clay bottoms in water $1\frac{1}{2}$ to $3\frac{1}{2}$ feet deep.

Pisidium sargenti Sterki. Small individuals were collected on a sand bottom in one and a half feet of water.

Pisidium scutellatum Sterki. One of the most abundant of these minute clams, occurring on gravel, sand, clay, and mud bottoms in water one and a half to 13 feet deep.

Pisidium scutellatum cristatum Sterki. More common than the typical form and occurring usually with it.

Pisidium splendidulum Sterki. Occurs on a clay bottom in 5 feet of water.

Pisidium variabile Prime. Found in water 2-13 feet deep on

gravel, sand, clay, and mud bottoms. Most abundant in mud in 4-11 feet of water. The specimens are smaller than normal.

Pisidium vesiculare Sterki. Mud bottom in water 8-11 feet deep.

A number of *Pisidia* and *Musculia* are still in the hands of Dr. Sterki awaiting identification. They are either peculiar forms of well known species or are undescribed, and several species are represented. Of the material collected in 1915 Dr. Sterki says; "You should have 30 species or more of Sphæriidæ in your vicinity; and there ought to be more than 20 species (plus varieties) of *Pisidium*." With the 1916 material we nearly reach Sterki's estimate of probabilities—26 species of the family named and six unnamed. Of *Pisidium* there are 18 named species and five unnamed. Several of the species listed are recorded from New York State for the first time. The Sphæriidæ of Lower South Bay consist of small individuals with slight shells and more or less weak hinges due to some physical property of the water, perhaps a lack of lime. The maximum development of this family, both in species and individuals, appears to be in comparatively deep water.

VIVIPARIDÆ.

Vivipara contectoides W. G. Binney. Collected from a mud bottom in 9 feet of water. Only one specimen, half grown, was found and this was probably brought to its location by currents. This species is abundant in the west end of the lake, near Brewerton, where it lives on a sand bottom in shallow water.

Campeloma decisum (Say.) Collected from a sand and clay bottom in water one and a half to 5 feet deep. More abundant on a clay bottom. The majority of the individuals of *decisum* collected in July 1916 were young or immature, adults being very rare. It seems evident that the young of this species are born in the spring and attain their first year's growth by September or early October. Information concerning the details of the breeding habits of this group of mollusks are desirable.

AMNICOLIDÆ.

Gillia altilis (Lea). Occurs on boulder, gravel, sand, and mud bottoms in water 1-14 feet deep. Half-grown and adult individuals were abundant in some habitats.

Somatogyrus subglobosus (Say). A few specimens were collected associated with *Gillia*. All were immature.

Bythinia tentaculata (Linn.). This common species occurs abundantly in Lower South Bay on gravel, sand, clay, and mud bottoms in water 1-14 feet deep. Most abundant on clay and mud bottoms in water 4-14 feet deep. A large percentage of the individuals collected were young or immature. This species is especially abundant in filamentous algæ (mostly *Cladophora fracta*) and a single specimen was collected from a leaf of the arrowhead, *Sagittaria arifolia*. A pint of algæ, representing 100 square inches of area on an old log in 5 feet of water, yielded 97 adult and 1270 young individuals of this species.

Amnicola limosa porata (Say). This is the largest *Amnicola* in the lake, and was found only in three habitats: boulder bottom in one foot of water, sand bottom in four and a half feet, and mud bottom in 18 feet of water. It was most abundant on a rocky shoal in water a foot deep, a single boulder having 54 specimens. Typical *limosa* is apparently not found in this part of the lake.

Amnicola bakeriana nimia Pils.¹ This is the most abundant *Amnicola* in the lake, easily known by its wide swollen shell. It occurs on all kinds of bottom in water from 1-18 feet deep; about 10 per cent of the material collected was immature. Most abundant, as are all of the species of the genus, in filamentous algæ. A single specimen was found on the leaf of *Sagittaria arifolia*.

Amnicola bakeriana Pilsbry. One of the most abundant species in the lake easily recognized by its long spire and deep-sutured whorls. It occurs on all varieties of bottom, though least numerous on boulder and most numerous on clay and mud bottoms where there is a heavy growth of algæ. In depth it is most abundant in water from 3-6 feet deep, and occurs from

¹ NAUTILUS, xxxi, pp. 44-46, 1917.

1-18 feet deep. It was dredged in great abundance on a mud bottom covered with *Cladophora fracta*, in $8\frac{1}{2}$ feet of water. Many immature individuals occur with the adults.

Amnicola oneida Pilsbry. This is the narrowest species in the lake, greatly resembling *Amnicola lustrica* but being more slender. It was first seen in 1915 in a lot of shells from Frenchman Island¹ but only one specimen was secured. It occurs on all varieties of bottom and in all depths of water from one and a half to 15 feet. It is not common on boulder or gravel bottoms, but on sand, clay, and mud bottoms, where there is a covering of filamentous algæ (*Cladophora*, *Oedogonium* or *Spirogyra*) in $2\frac{1}{2}$ to 4 feet of water, it is the commonest mollusk in the region. In one or two dredgings it was found in abundance in 8-9 feet of water but it is not usually plentiful in deeper water. Many young and immature individuals were collected with the adults.

Amnicola clarkei Pils. This small, subacute species was found associated with *bakeriana* in four places, though it is not as abundant as that species. Occurs on sand, clay, and mud bottoms, in water 3- $8\frac{1}{2}$ feet deep, usually in filamentous algæ.

Amnicola emarginata (Küster). This characteristic species occurred sparingly in water from 10-18 feet deep on mud and gravel bottoms, usually with the filamentous algæ *Cladophora* and *Spirogyra*.

PLEUROCERIDÆ.

Goniobasis livescens (Menke). Found only on boulder and gravel bottoms, on exposed shores or points, in water one and a half to four feet deep. Most abundant in water 1-3 feet deep on a boulder shore. Many young and immature individuals occur. The species as it is found in Lower South Bay varies in the obesity of the body whorl, narrow forms occurring, some with faint bands resembling the shell from Illinois called *depygis*. The columella is deeply tinged with purple. Several young individuals were collected having strongly keeled whorls and measuring 16 mm in width and 7 mm in width.

¹ See Technical Bulletin, IV, page 269, fig. 45, No. 21.

VALVATIDAE.

Valvata tricarinata (Say). Found on all varieties of bottom, except sandy clay, and in all depths of water down to 18 feet. It occurs in numbers on a sand bottom at four feet, on clay bottom at $3\frac{1}{2}$ feet, on a mud bottom at 8 and 18 feet, and on a gravel bottom at 15 feet. It is rare on gravel and boulder bottoms in shallow water. In this area it is usually associated with filamentous algæ, *Cladophora* or *Oedogonium*. Many young and immature specimens occurred as well as some variations in the position of the carinæ.

Valvata bicarinata normalis Walker. Occurred sparingly on gravel, sand, clay, and mud bottoms in water 2-6 deep.

Valvata sincera (Say). This is a deep water form and occurred on gravel and mud bottoms in water $11\frac{1}{2}$ -18 feet deep, usually associated with the alga *Cladophora fracta*. It was most abundant in water 15-18 feet deep.

PHYSIDAE.

Physa warreniana Lea. This tadpole snail occurred on all varieties of bottom in water from one half to $11\frac{1}{2}$ feet deep. It is abundant, however, only in water one half to one and a half feet deep and the numbers decrease with depth. A gravel or boulder bottom is the normal habitat of this species when adult, but when young or immature, as was the case with the greater number of individuals collected (1-3 mm) it lives in filamentous algæ (*Oedogonium*, *Cladophora*, *Spirogyra*). Of 47 lots collected in 1916 but six contained adult animals. This seems to be another species that attains maturity in the fall, adults being abundant the previous year, in September, in shallow water where but few immature shells were seen. This form of *Physa* seems to differ sufficiently from *ancillaria* to be considered a species and there seems to be no reason why it should not be called *Physa warreniana*. It varies greatly in the sculpturing of the shell, many individuals occurring that have a smooth, polished shell.

Physa integra Haldeman. Occurs on boulder, sand, clay and mud bottoms in water one and a half to ten feet deep. Most abundant on a sand bottom in water one and a half feet deep,

and on a clay bottom in water two feet deep. The majority of the individuals were young or immature (3-5 mm.) and were frequently associated with algæ (*Oedogonium*, *Chara*, *Nitella*) or with the higher vegetation. In one habitat they were found on *Potamogeton interruptus* and *Myriophyllum verticillatum*.

Physa heterostropha Say? Several young shells (7 mm. long) thought to be this species were found in Tuttle Brook, Chittengo Creek. The surface is smooth and shining and the general slope agrees with shells from Philadelphia which are undoubted *heterostropha*. No adult shells were observed.

ANCYLIDAE.

Ancylus parallelus Haldeman. This characteristic fresh-water limpet was collected from all bottoms except boulder in water one and a half to 11 feet deep, the greater number occurring on a sandy clay bottom in one and a half feet of water. In this area it is associated with filamentous algæ (*Oedogonium*, *Cladophora*) but it is usually more abundant on such plants as *Nymphaea*, *Castalia*, *Typha* and *Sparganium*.

Ancylus fuscus Adams. Young individuals of this species were found in one habitat on a sandy clay bottom in one and a half feet of water.

Ancylus species. A single specimen of *Ancylus* was found on a boulder bottom in two and a half feet of water. It was submitted to Dr. Bryant Walker who says of it, "I cannot be sure of the species and therefore prefer to leave it with a question until you get more, which would be very desirable. It does not seem to be any of the more common species."

PLANORBIDAE.

Planorbis trivolvis Say. Specimens of typical *trivolvis* were found in but one habitat, a quiet lagoon on a mud bottom in one and a half feet of water.

Planorbis trivolvis variety. This form of *trivolvis*, listed in Technical Bulletin No. IV, page 277, was again obtained in 1916, on sand, boulder, gravel and clay bottoms in water one and a half feet deep. Ecologically this form of *trivolvis* differs from the typical form and it would be convenient for it to have

a name. It is suggested that the name *fallax* of Haldeman is applicable and seems to represent a shell of the kind here indicated.

Planorbis binneyi Tryon. Common on a boulder shore in one half to one and a half feet of water. Also collected on sand and clay bottoms in one and a half to five feet of water. The majority of the specimens were young or immature. Three young individuals were found on a leaf of *Sagittaria arifolia*.

Planorbis antrosus Conrad. Occurs on all varieties of bottom, in water one and a half to 18 feet deep. It is more abundant at a depth of one and a half to three feet on a sand or clay bottom, and is usually associated with the filamentous algæ *Cladophora* and *Oedogonium*. Also found on floating leaves of *Potamogeton natans*. The majority of individuals were young or immature and the adults were smaller than normal.

Planorbis campanulatus Say. Common on all varieties of bottom in water 1-9 feet deep. It is most abundant on a sand bottom in $1\frac{1}{2}$ -5 feet of water. In most habitats it is associated with filamentous algæ (*Oedogonium*, *Cladophora*, *Spirogyra*). About half the individuals collected were young or immature.

Planorbis parvus Say. Occurs on all varieties of bottom in water $1\frac{1}{2}$ -12 feet deep, but is most abundant on clay, sand, and mud bottoms in water $1\frac{1}{2}$ -4 feet deep. It is usually rarest on boulder bottoms, but on a shoal north of Dunham Island a single boulder 6x4x3 inches had 15 *parvus* on its surface. This species is usually associated with the algæ mentioned under the last species and is also frequently found on the leaves of *Nymphaea*, *Castalia*, *Sagittaria arifolia*, *Myriophyllum*, and *Potamogeton interruptus* and *Richardsoni*. *Parvus* is the most abundant *Planorbis* in the region the algæ in many places being filled with this species and one of the Amnicolas.

Planorbis hirsutus Gould. This species occurs on all varieties of bottom except clay, in water $1\frac{1}{2}$ -9 feet deep, being most abundant at 3-4 feet on a sand bottom. Rare on boulder and gravel bottoms. Associated with filamentous algæ.

Planorbis deflectus Say. This species is apparently rare in Lower South Bay occurring in but three habitats, on a gravel bottom in $2\frac{1}{2}$ feet of water.

Planorbis exacuus Say. Occurs on all varieties of bottom in 1½–15 feet of water. Most abundant on sand and mud bottoms in 2–5 feet of water. It is rare on gravel bottom but is fairly common on boulder bottom, two to four individuals being found on each stone.

Segmentina armigera (Say). This species was collected in two habitats, one a swampy shore in Short Bay among the alga *Oedogonium* and the other in a protected bay on the north side of Frenchman Island, on leaves of *Sagittaria arifolia*. Both habitats are in shallow water with mud bottoms.

LYMNAEIDAE.

Lymnæa stagnalis lillianæ Baker. This, the largest of the gastropods in the lake, was found only in one habitat, the rocky shore of the lake, east of Norcross Point, in water a few inches to two feet in depth. All were immature, half or three-quarters grown. A single young shell (dead) 14 mm. in length was found in a small bay on the south shore of Long Point in water 3½ feet deep, but it had evidently been brought there from some other habitat.

Pseudosuccinea columella chalybea (Gould). Collected in two habitats, a protected bay on *Nymphaea* leaves, and a partly enclosed lagoon among filamentous algæ, *Oedogonium*. All specimens were immature.

Acella haldemani ("Deshayes" Binney). Observed in two habitats on submerged vegetation, always in a protected situation, in water from 1–4 feet deep. All of the specimens were young, none exceeding 10 mm. in length, and were invariably found on the narrow leaves of *Potamogeton interruptus*. For the ecology of this species see the NAUTILUS, XXX, pages 135–138.

Galba catascopium (Say). One of the most abundant of Oneida Lake mollusks, found on all varieties of bottom in water 1½ to 14 feet deep. It is most abundant on sand and mud bottoms, associated with filamentous algæ, when young, and on boulder and gravel bottoms when adult.

Galba obrussa (Say). A single dead shell of this species was found in a dredging on a bar near a small lagoon east of the steamboat landing in 1½ feet of water. It was young, 5 mm.

long, and had evidently been washed into this habitat from some region along shore.

Galba humilis modicella (Say). Found in two habitats, one a lagoon among floating algæ (*Oedogonium*) and the other in Tuttle Brook, a tributary of Chittanango Creek, near the shore, in a few inches of water among the algæ *Oedogonium* and *Cladophora*. In the latter the mollusks were very abundant crawling on the shore at the margin of the water.

SUCCINEIDAE.

Succinea retusa Lea. Small specimens of this species were very abundant along the shore at Becker's landing, crawling over the rocks on the shore near the margin of the lake.

*The New York State College of Forestry,
Syracuse University.*

NEW LAND SHELLS FROM CALIFORNIA AND NEVADA.

H. A. PILSBRY AND JAS. H. FERRISS.

EPIPHRAGMOPHORA CALLISTODERMA n. sp. Pl. 7, fig. 3.

The shell is narrowly umbilicate, thin, cinnamon-brown, fading on the base to tawny olive, having a chesnut-brown band at the shoulder, with a wide border below and a narrow one above of olive buff. Sculpture of inconspicuous growth-wrinkles, and under the microscope, it is seen to be set with rounded pustules in high relief (about 35 in a square mm. on the upper part of the last whorl); they are rather irregularly arranged, along the growth-wrinkles the surface between pustules having very beautiful fine and close sculpture of wrinkles, which are parallel in spiral bands on the shell, elsewhere irregular and interrupted. This gives the shell a many-banded appearance, in certain lights.

Whorls nearly $5\frac{1}{2}$, narrow and closely wound, the last relatively very wide, broadly rounded peripherally, descending a little in front. The aperture is large, oblique, margins but slightly expanding, at the columella dilated partly over the umbilicus. Alt. 16, diam. 23 mm. oblique alt. of aperture 13, width 14 mm.